



Mathematics Advanced Exams & Marking Criteria

Student name: _____



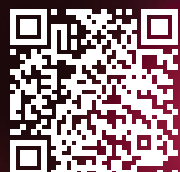


WESTERN SYDNEY
UNIVERSITY



STUDY AT
WESTERN

EXPLORE OUR *PROGRAMS*



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Just because you don't fit the usual entry-mould for uni doesn't mean you can't get in. Maybe you didn't get the ATAR you wanted. Maybe you don't have an ATAR at all. Maybe there were things happening in your life that got in the way of your study.

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- Aboriginal and Torres Strait Islander Entry Program
- Schools Recommendation Scheme
- TAFE/Tertiary Education Pathways
- Rural Entry Admission Scheme
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Our Diploma courses provide a springboard to diverse career options or your pathway into the second year of a Bachelor degree at Western.

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LOVE THESE SUBJECTS? SEE WHERE THEY CAN TAKE YOU! FIND YOUR PATH FROM HSC TO UNIVERSITY.

YOU LOVE ENGLISH? *WHY NOT STUDY:*

- B Communication
- B Screen Media (Arts and Production)
- B Education (Primary)
- B Education (Secondary)
- B Arts
- B Arts (Interpreting and Translation)
- B Laws
- B Performing Arts (Acting)
- B Music
- B Design (Visual Communication)
- B Music
- B International Studies

YOU LOVE STUDIES OF RELIGION? *WHY NOT STUDY:*

- B Arts
- B Social Science
- B Education (Primary)
- B Education (Secondary)

YOU LOVE HISTORY? *WHY NOT STUDY:*

- B Arts
- B International Studies
- B Social Science
- B Education (Primary)
- B Education (Secondary)
- B Tourism and Event Management
- B Planning (Pathway to M Urban Management and Planning)

YOU LOVE VISUAL ARTS? *WHY NOT STUDY:*

- B Architectural Design
- B of Design
- B of Design and Technology
- B of Industrial Design (Honours)

YOU LOVE BUSINESS STUDIES? *WHY NOT STUDY:*

- B Business
- B Accounting
- B Education (Primary)
- B Education (Secondary)
- B Tourism and Event Management
- B Construction Management (Honours)

YOU LOVE LEGAL STUDIES? *WHY NOT STUDY:*

- B Criminology
- B Criminal and Community Justice
- B Cyber Security and Behaviour
- B Policing
- B Laws
- B Social Science
- B Humanitarian and Development Studies
- B Education (Primary)
- B Education (Secondary)
- B Construction Management (Honours)
- B Social Work
- B Youth Work

YOU LOVE COMMUNITY AND FAMILY STUDIES STUDIES? *WHY NOT STUDY:*

- B Arts
- B Criminology
- B Nursing
- B Midwifery
- B Psychology (Honours)
- B Psychological and Social Sciences
- B Social Science
- B Youth Work
- B Social Work
- B Humanitarian and Development Studies
- B Education (Early Childhood)
- B Education (Primary)
- B Education (Secondary)

YOU LOVE PHYSICS? *WHY NOT STUDY:*

- B Science
- B Education (Primary)
- B Education (Secondary)
- B Engineering
- B Architectural Design
- B Industrial Design (Honours)
- B Design and Technology

YOU LOVE CHEMISTRY? *WHY NOT STUDY:*

- B Science
- B Medical Science
- B Education (Primary)
- B Education (Secondary)

YOU LOVE HEALTH AND MOVEMENT SCIENCE? *WHY NOT STUDY:*

- B Health Science
- B Health, Physical Education and Sport
- B Exercise Physiology
- B Exercise Science
- B Sport and Performance Science
- B Occupational Therapy
- B Paramedicine
- B Physiotherapy
- B Podiatric Medicine
- B Speech Pathology
- B Traditional Chinese Medicine
- B Nursing
- B Midwifery
- B Education (Primary)

YOU LOVE MATHEMATICS? *WHY NOT STUDY:*

- B Computer Science
- B Data Science
- B Information and Communication Technology
- B Information Systems
- B Mathematics
- B Engineering
- B Education (Primary)
- B Education (Secondary)
- B Planning (Pathway to M Urban Management and Planning)
- B Accounting

YOU LOVE BIOLOGY? *WHY NOT STUDY:*

- B Health Science
- B Health, Physical Education and Sport
- B Occupational Therapy
- B Paramedicine
- B Physiotherapy
- B Podiatric Medicine
- B Speech Pathology
- B Sport and Performance Science
- B Traditional Chinese Medicine
- B Science
- B Medical Science
- B Nursing
- B Midwifery
- B Education (Primary)
- B Education (Secondary)
- B Clinical Science/Doctor of Medicine

At Western, we have a wealth of support services to help you navigate your university journey:

- Programs to help you settle into uni life as well as your studies
- Student Welfare Service
- Counselling and mental health and wellbeing services
- Disability services

- Members of the ADF – Student Veteran Program
 - Elite athletes and performers support
- westernsydney.edu.au/support



HSC SIMULATED EXAM

Mathematics Advanced

Topic 1 - Functions

General Instructions:

- Reading time – 5 minutes
- Working time – 1 hour
- Write using a black pen
- A reference sheet is provided
- NESA approved calculators may be used
- For questions in Section II, show all relevant mathematical reasoning and/or calculations

Total Marks:
30

Section I - 10 Marks

- Attempt Questions 1-10
- Allow about 15 mins for this section

Section II - 20 Marks

- Attempt Questions 11-14
- Allow about 45 mins for this section

Section I

10 marks

Attempt Questions 1 to 10

Allow approximately 15 minutes for this section

Use the multiple-choice answer sheet for Questions 1 to 10

Questions	Marks
1. Which relation is NOT a function?	1
(A) $x^2 + y^2 = 9$	(C) $y = 9x$
(B) $y = 9$	(D) $y = \frac{9}{x}$
2. Which of the following is an odd function?	1
(A) $y = e^x$	(C) $y = x $
(B) $y = \ln x$	(D) $y = \frac{9}{x}$
3. What is the gradient of any line perpendicular to the line $2x + 3y - 6 = 0$?	1
(A) $-\frac{2}{3}$	(C) $-\frac{3}{2}$
(B) $\frac{2}{3}$	(D) $\frac{3}{2}$
4. Which point is the vertex of the parabola $y = (x - 3)^2$?	1
(A) $(0, 3)$	(C) $(3, 0)$
(B) $(0, -3)$	(D) $(-3, 0)$
5. Given that $f(x) = x - 3$ and $g(x) = \sqrt{x}$, what is the value of $f(g(9))$?	1
(A) 0	(C) $\sqrt{6}$
(B) 3	(D) 18

6. What is the range of the function $y = e^x + 1$? 1
- (A) $y > -1$ (C) $y > 1$
(B) $y > 0$ (D) $y \geq 1$
7. What is the domain of the function $y = \log_e(2x - 1)$? 1
- (A) $x \geq \frac{1}{2}$ (C) All real x , $x \neq \frac{1}{2}$
(B) $x > \frac{1}{2}$ (D) $x \leq \frac{1}{2}$
8. Consider the graph of $y = 9 - x^2$. Which values of satisfy $9 - x^2 > 0$? 1
- (A) $x < 3$ (C) $x > 3$
(B) $-3 < x < 3$ (D) $x < -3$ or $x > 3$
9. Consider the graphs of $y = x^2$ and $y = |x|$. 1
- How many solutions does the equation $|x| = x^2$ have?
- (A) 0 (C) 2
(B) 1 (D) 3
10. Consider the graphs $y = x^2$ and $y = x^3$. Which values satisfy $x^2 < x^3$? 1
- (A) $x < 0$ (C) $0 < x < 1$
(B) $x > 1$ (D) $x > 0$

End of Section I

Section II

20 marks

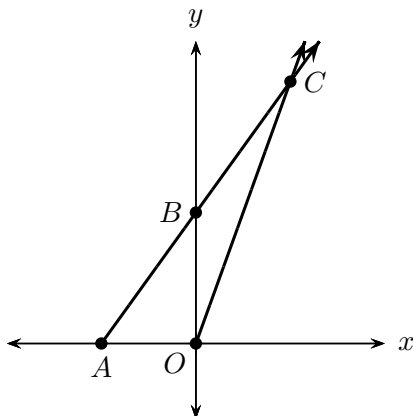
Attempt Question **11** to **14**

Allow approximately 45 minutes for this section

Question 11

Marks

In the diagram below, A and B are points on the x and y axes respectively.



The line AB has equation $\sqrt{3}x - y + \sqrt{3} = 0$. The point C lies on AB such that the area of $\triangle AOC$ is $3\sqrt{3}$ square units.

- | | | |
|-----|--|----------|
| (a) | Show that the coordinates of A and B are $(-1, 0)$ and $(0, \sqrt{3})$. | 2 |
| (b) | Find the gradient of AB . | 1 |
| (c) | Find the size of $\angle BAO$. | 1 |
| (d) | Hence find the length of AC . | 2 |

Question 12

Marks

Consider the quadratic function $x^2 - (k + 2)x + 4 = 0$. **2**

For what values of k does the quadratic function have real roots?

Question 13**Marks**

- (a) Sketch the graph of the function $y = \sqrt{9 - x^2}$. **1**
- (b) State the domain and range of $y = \sqrt{9 - x^2}$. **2**
- (c) Hence, or otherwise, state the domain and range of the function $y = -4\sqrt{9 - x^2}$. **2**

Question 14**Marks**

- (a) Sketch the graph of the function $y = |2x - 4|$, clearly showing the points where the graph intersects with the axes. **2**
- (b) Hence, or otherwise, solve $|2x - 4| = 4$. **2**
- (c) Using part (a), or otherwise, find all values of m for which the equation $|2x - 4| = mx + 1$ has no solutions. Justify your answer. **3**

End of paper.



HSC SIMULATED EXAM

Mathematics Advanced

Topic 2 - Trigonometric Functions

General Instructions:

- Reading time – 5 minutes
- Working time – 1 hour
- Write using a black pen
- A reference sheet is provided
- NESA approved calculators may be used
- For questions in Section II, show all relevant mathematical reasoning and/or calculations

Total Marks:
30

Section I - 10 Marks

- Attempt Questions 1-10
- Allow about 15 mins for this section

Section II - 20 Marks

- Attempt Questions 11-18
- Allow about 45 mins for this section

Section I

10 marks

Attempt Questions 1 to 10

Allow approximately 15 minutes for this section

Use the multiple-choice answer sheet for Questions 1 to 10

Questions	Marks
1. Which of the following is an even function?	1
(A) $y = \sin x$	(C) $y = \cos x$
(B) $y = \tan x$	(D) $y = \operatorname{cosec} x$
2. What is the value of $\sec^2 \frac{\pi}{4}$?	1
(A) $\frac{1}{2}$	(C) 2
(B) $\frac{1}{\sqrt{2}}$	(D) $\sqrt{2}$
3. How many solutions does the equation $\sin x = 0$ have for $-2\pi \leq x \leq 2\pi$?	1
(A) 2	(C) 4
(B) 3	(D) 5
4. Consider the function $y = 3 \cos(2\pi x) - 1$. What is the period?	1
(A) 4	(C) 2π
(B) 4π	(D) 1
5. Consider the function $y = \sin 2x - 3$. What is the range?	1
(A) $-1 \leq y \leq 1$	(C) $-3 \leq y \leq 0$
(B) $-3 \leq y \leq 3$	(D) $-4 \leq y \leq -2$

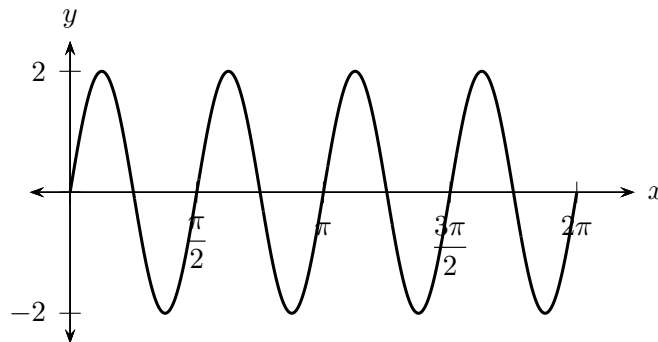
6. Which of the following expressions has the same value as $\cos 6\pi$? 1

(A) $\sec 6\pi$ (C) $\operatorname{cosec} 6\pi$
 (B) $\sin 3\pi$ (D) $\cos 3\pi$

7. Which of the following expressions is equivalent to $\tan \theta + \cot \theta$? 1

(A) $\sec \theta \operatorname{cosec} \theta$ (C) $\sec \theta - \operatorname{cosec} \theta$
 (B) $\sec \theta + \operatorname{cosec} \theta$ (D) 1

8. Which of the following functions describes the graph shown? 1



(A) $y = 3 \sin 2x$ (C) $y = 3 \sin \frac{x}{2}$
 (B) $y = 2 \sin 4x$ (D) $y = 2 \sin \frac{x}{4}$

9. The bearing from A to B is 130 degrees. What is the bearing from B to A ? 1

(A) 50° (C) 300°
 (B) 230° (D) 310°

10. A sector of a circle has a radius of 14 cm and an arc length of 7 cm. 1

What is the area of the sector?

(A) 3.5 cm^2 (C) 98 cm^2
 (B) 49 cm^2 (D) 196 cm^2

End of Section I

Section II

20 marks

Attempt Question **11** to **18**

Allow approximately 45 minutes for this section

Question 11

Marks

Find the exact value of $\tan \frac{\pi}{3} + \operatorname{cosec} \frac{\pi}{4}$.

2

Question 12

Marks

Prove that $\frac{\sin^3 \theta}{\cos \theta} + \sin \theta \cos \theta = \tan \theta$.

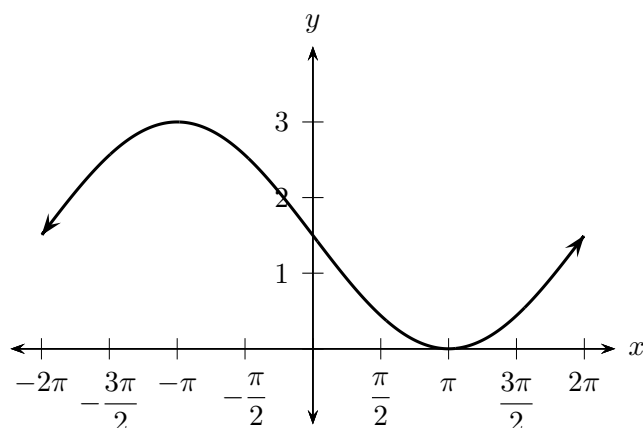
2

Question 13

Marks

A section of a trigonometric curve is shown.

2



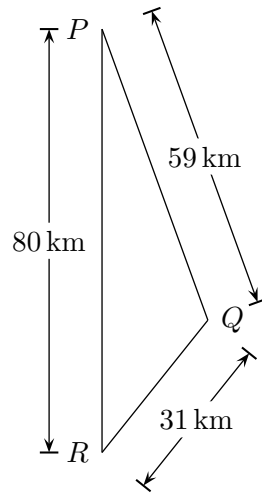
Given that the equation of the curve is of the form $y = a \sin(nx) + k$, find the values of a , n and k .

Question 14

Marks

The diagram shown represents three ships labelled P , Q and R . The point P is 80 km due north of R . The point Q is 59 km from P and 31 km from R .

3



Show that the bearing of Q from P is 161° . Give your answer correct to the nearest degrees.

Question 15

Marks

A person walks 21 km due east from A . Another person walks 12 km from A on a bearing of $322^\circ 29'$.

2

How far apart are they, correct to the nearest km?

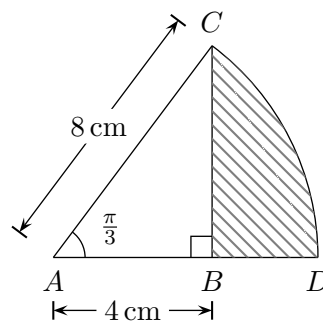
Question 16

Marks

A right-angled triangle ACB is placed in a sector of a circle with radius 8 cm.

2

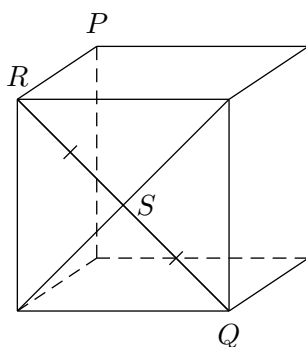
It is given that $AB = 4$ cm and $\angle BAC = \frac{\pi}{3}$ radians.



Calculate the exact area of the shaded region BCD .

Question 17**Marks**

Consider a cube with side lengths 1 cm in length.

2

The point S is the midpoint of the diagonal QR . Calculate the size of $\angle PSR$, correct to the nearest minute.

Question 18**Marks**

- (a) Sketch the graph of $y = 2 \sin 2x + 2$ for $0 \leq x \leq 2\pi$. **2**
- (b) Hence, or otherwise, solve the equation $2 \sin 2x + 2 = 2$ for $0 \leq x \leq 2\pi$. **2**
- (c) Hence state the number of solutions to the equation **1**

$$2 \sin 2x + 2 = 2x$$

End of paper.



HSC SIMULATED EXAM

Marking Criteria

Mathematics Advanced

Topic 1 - Functions

Multiple Choice Answers

Question	Answer
1	A
2	D
3	D
4	C
5	A
6	C
7	B
8	B
9	D
10	B

Question 1 $x^2 + y^2 = 9$ is a circle, a many-to-many relation.

$\Rightarrow (A)$

Question 2 $y = \frac{9}{x}$ has point symmetry about the origin.

$\Rightarrow (D)$

Question 3 $2x + 3y - 6 = 0$

$y = -\frac{2}{3}x + 3$ has $m_1 = -\frac{2}{3}$

gradient of perpendicular: $m_2 = -\frac{1}{(-\frac{2}{3})}$

$= \frac{3}{2} \Rightarrow (D)$

Question 4 $y = (x-3)^2 + 0$ has vertex is $(3,0) \Rightarrow (C)$

Question 5 $f(g(9)) = f(\sqrt{9})$

$= f(3)$

$= 3-3$

$= 0$

$\Rightarrow (A)$

Question 6

$$y = e^x \text{ has range } y > 0$$

$y = e^x + 1$ is translated up 1 unit

$\therefore$ range is $y > 1$

$\Rightarrow (C)$

Question 7

$$y = \log_e(2x-1)$$

$$= \log_e(2(x - \frac{1}{2}))$$

$y = \log_e 2x$ has domain $x > 0$

translated right $\frac{1}{2}$ unit

$\therefore$ domain $x > \frac{1}{2}$

$\Rightarrow (B)$

Question 8

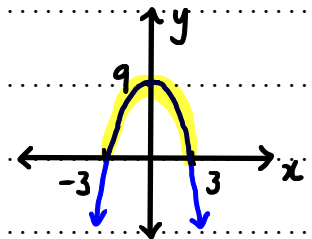
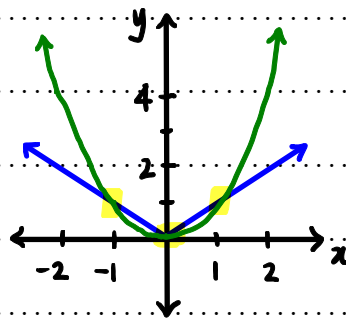
$$y = 9 - x^2$$

$$= (3+x)(3-x)$$

Roots at $x = -3$ and $x = 3$

$\therefore -3 < x < 3$

$\Rightarrow (B)$

Question 9

$\therefore$ 3 solutions

$\Rightarrow (D)$

Question 10

$$x^2 < x^3$$

$$x^2 - x^3 < 0$$

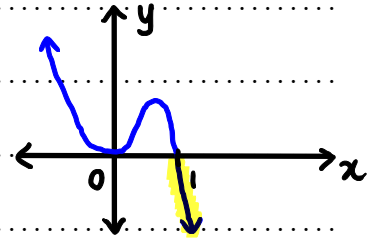
$$x^2(1-x) < 0$$

Roots at $x=0$ and $x=1$,

double root at $x=0$

$$\therefore x > 1$$

$\Rightarrow (B)$



— END OF SECTION I SOLUTIONS —

Question 11 (a)

$$AB: \sqrt{3}x - y + \sqrt{3} = 0$$

$$\text{Let } y=0: \sqrt{3}x + \sqrt{3} = 0$$

$$x = -1$$

$\therefore$ x-intercept is $A(-1, 0)$

$$\text{Let } x=0: -y + \sqrt{3} = 0$$

$$y = \sqrt{3}$$

$\therefore$ y-intercept is $B(0, \sqrt{3})$

$$(b) m_{AB} = \frac{0 - \sqrt{3}}{-1 - 0}$$

$$\therefore m_{AB} = \sqrt{3}$$

Question 11 (c) $m_{AB} = \tan \angle BAO$

$$\sqrt{3} = \tan \angle BAO$$

$$\therefore \angle BAO = 60^\circ \quad \left(\text{or } \frac{\pi}{3} \text{ radians}\right)$$

(d) Area $\triangle AOB = \frac{1}{2} \times AO \times AC \times \sin \angle BAO$

$$3\sqrt{3} = \frac{1}{2}(1)(AC)(\sin 60^\circ)$$

$$\frac{\sqrt{3}}{4} AC = 3\sqrt{3}$$

$$\therefore AC = 12 \text{ units}$$

Question 12 $x^2 - (k+2)x + 4 = 0$

$$\Delta = [-(k+2)]^2 - 4(1)(4)$$

Real roots if $\Delta \geq 0$

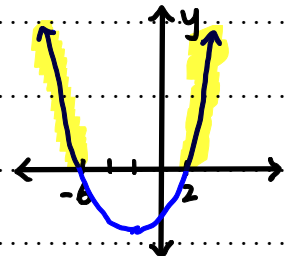
$$k^2 + 4k + 4 - 16 \geq 0$$

$$k^2 + 4k - 12 \geq 0$$

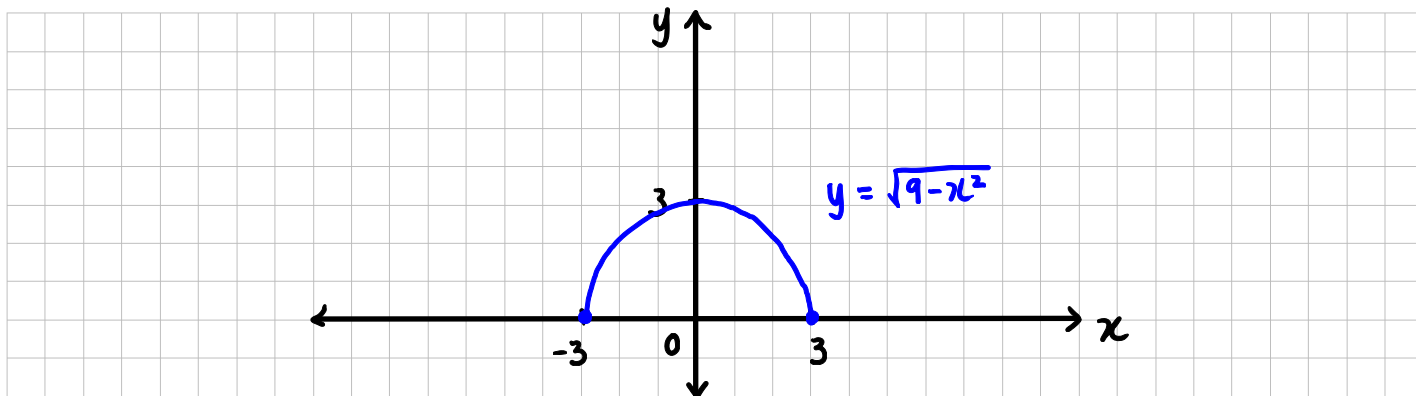
$$(k+6)(k-2) \geq 0$$

Roots at $k = -6$ and $k = 2$

$$\therefore k \leq -6 \text{ or } k \geq 2$$



Question 13 (a) $y = \sqrt{9 - x^2}$ is a semi-circle with $r = 3$



(b) Domain: $-3 \leq x \leq 3$

Range: $0 \leq y \leq 3$

(c) $y = -4\sqrt{9 - x^2}$ is reflected about the x -axis,
with vertical stretch factor of 4

$\therefore$ Domain: $-3 \leq x \leq 3$

Range: $-12 \leq y \leq 0$

Question 14 (a) $y = |2x - 4|$

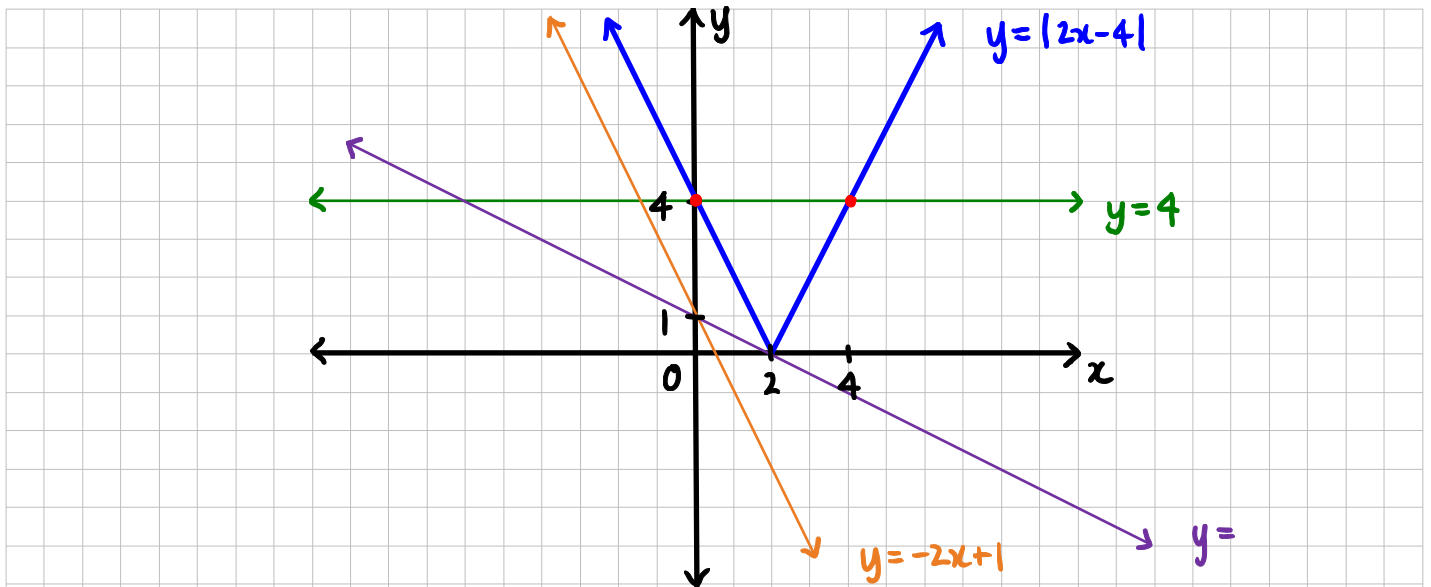
$$= |2(x - 2)|$$

Translated right by 2 units

$\therefore$ x-intercept at $(2, 0)$

Let $x = 0$: $y = |-4|$

$\therefore$ y-intercept at $(0, 4)$



(b) The solutions of $|2x - 4| = 4$ are the intersections between $y = |2x - 4|$ and $y = 4$.

From graph:

Solutions are $x = 0$ and $x = 4$

(continued...)

Question 14 (c) The solutions of $|2x-4| = mx+1$ are the intersections between $y=|2x-4|$ and $y=mx+1$

$$|2x-4| = \begin{cases} 2x-4 & \text{for } 2x-4 \geq 0 \\ -(2x-4) & \text{for } 2x-4 < 0 \end{cases}$$

$$y=|2x-4| \text{ is } y=-2x+4 \text{ for } x < 2$$

$$\text{Gradient is } m = -2$$

$\therefore y = -2x+1$ is parallel to $y = |2x-4|$ for $x < 2$ and doesn't intersect $y = |2x-4|$

Consider $(0,1)$ and $(2,0)$

$$\begin{aligned} m &= \frac{1-0}{0-2} \\ &= -\frac{1}{2} \end{aligned}$$

$$\begin{aligned} \text{Using } (2,0): \quad y &= -\frac{1}{2}(x-2) \\ &= -\frac{1}{2}x+1 \end{aligned}$$

$\therefore y = -\frac{1}{2}x+1$ only intersects $y = |2x-4|$ once

Hence $-2 \leq m < -\frac{1}{2}$ as any $y = mx+1$ beyond $y = -2x+1$ and $y = -\frac{1}{2}x+1$ will intersect $y = |2x-4|$ at least once.

— END OF SECTION II SOLUTIONS —



HSC SIMULATED EXAM

Marking Criteria

Mathematics Advanced

Topic 2 - Trigonometric

Functions

Question	Answer
1	C
2	C
3	D
4	D
5	D
6	A
7	A
8	B
9	D
10	B

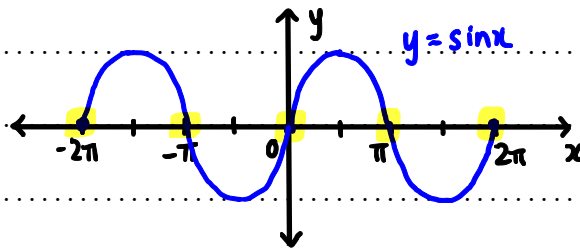
Question 1 $y = \cos x$ has line symmetry about the y-axis.

$\Rightarrow$ (C)

Question 2 $\sec^2 \frac{\pi}{4} = \frac{1}{\cos^2 \frac{\pi}{4}}$
 $= \frac{1}{(\frac{1}{\sqrt{2}})^2}$
 $= 2$

$\Rightarrow$ (C)

Question 3 Solutions to $\sin x = 0$ are the x-intercepts to $y = \sin x$



$\therefore$ 5 solutions

$\Rightarrow$ (D)

Question 4 $y = 3 \cos(2\pi x) - 1$ has $n = 2\pi$

$$T = \frac{2\pi}{2\pi}$$

$$= 1$$

$\Rightarrow$ (D)

Question 5 $y = \sin 2x - 3$ has $a=1$ and is

translated down by 3 units

$$-1-3 \leq y \leq 1-3$$

$$\therefore \text{Range is } -4 \leq y \leq -2 \Rightarrow (D)$$

Question 6

$$\cos 6\pi = \cos 2\pi$$

$$= 1$$

$$\sec 6\pi = \frac{1}{\cos 6\pi}$$

$$= 1$$

$$\therefore \sec 6\pi = \cos 6\pi \Rightarrow (A)$$

Question 7

$$\tan \theta + \cot \theta = \frac{\sin \theta}{\cos \theta} + \frac{\cos \theta}{\sin \theta}$$

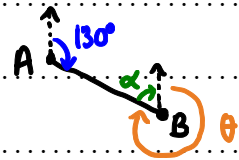
$$= \frac{\sin^2 \theta + \cos^2 \theta}{\sin \theta \cos \theta}$$

$$= \frac{1}{\sin \theta \cos \theta}$$

$$= \sec \theta \operatorname{cosec} \theta \Rightarrow (A)$$

Question 8The graph is a sine curve with $a=2$ and $n=4$

$$\therefore y = 2 \sin 4x \Rightarrow (B)$$

Question 9

$\alpha = 50^\circ$ (co-interior angles on parallel lines are supplementary)

$\theta = 310^\circ$ (angles at a point)

$\therefore$ Bearing of A from B is 310° $\Rightarrow$ (D)

Question 10

Given $r = 14$ cm, $l = 7$ cm

$$l = r\theta$$

$$7 = 14\theta$$

$$\theta = \frac{1}{2}$$

$$A = \frac{1}{2}(14)^2\left(\frac{1}{2}\right)$$

$$= 49 \text{ cm}^2$$

$\Rightarrow$ (B)

— END OF SECTION I SOLUTIONS —

Question 11

$$\tan \frac{\pi}{3} + \operatorname{cosec} \frac{\pi}{4} = \sqrt{3} + \frac{1}{\sin \frac{\pi}{4}}$$

$$= \sqrt{3} + \frac{1}{\left(\frac{1}{\sqrt{2}}\right)}$$

$$\therefore \tan \frac{\pi}{3} + \operatorname{cosec} \frac{\pi}{4} = \sqrt{3} + \sqrt{2}$$

Question 12

RTP: $\frac{\sin^3 \theta}{\cos \theta} + \sin \theta \cos \theta = \tan \theta$

$$\text{LHS} = \frac{\sin^3 \theta + \sin \theta \cos^2 \theta}{\cos \theta}$$

$$= \frac{\sin \theta (\sin^2 \theta + \cos^2 \theta)}{\cos \theta}$$

$$= \frac{\sin \theta}{\cos \theta}$$

$$= \tan \theta$$

$$\therefore \text{LHS} = \text{RHS}$$

Question 13

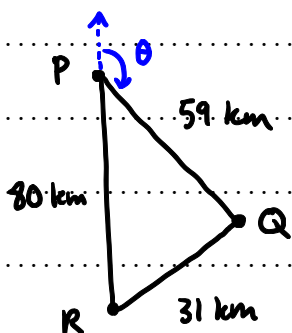
The graph has $a = \frac{3}{2}$, $n = \frac{1}{2}$ and

is translated up $\frac{3}{2}$ units, and

is reflected about the x -axis

$$\therefore y = -\frac{3}{2} \sin \frac{1}{2}x + \frac{3}{2}$$

$$\text{Hence } a = -\frac{3}{2}, n = \frac{1}{2}, k = \frac{3}{2}$$

Question 14

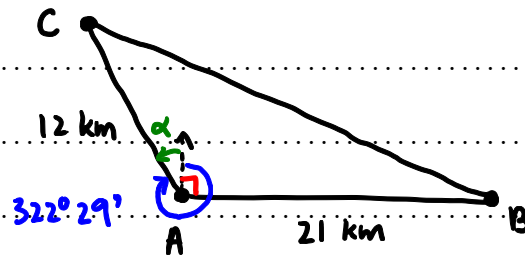
$$\cos \angle P = \frac{59^2 + 80^2 - 31^2}{2(59)(80)}$$

$$\angle P = 19^\circ 6'$$

$$\theta = 180^\circ - 19^\circ 6'$$

$$= 160^\circ 54'$$

Hence the bearing of Q from P is approximately 161°T .

Question 15

$$\alpha = 37^\circ 31' \quad (\text{angles at a point})$$

$$\begin{aligned} \angle CAB &= 90^\circ + 37^\circ 31' \\ &= 127^\circ 31' \end{aligned}$$

$$BC^2 = 12^2 + 21^2 - 2(12)(21) \cos 127^\circ 31'$$

$$\therefore BC = 29.865 \dots \text{ km}$$

Hence they are approximately 30 km apart.

Question 16

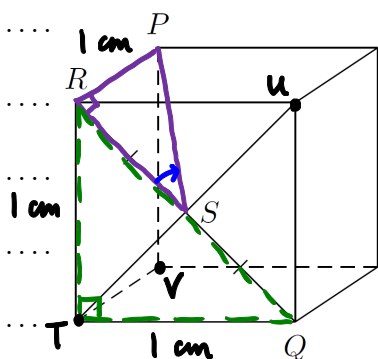
$$\begin{aligned} \text{Area of Sector CAD} &= \frac{1}{2}(8)^2\left(\frac{\pi}{3}\right) \\ &= \frac{32\pi}{3} \end{aligned}$$

$$\text{In } \triangle ACB: \quad BC^2 + 4^2 = 8^2$$

$$\begin{aligned} BC &= \sqrt{48} \\ &= 4\sqrt{3} \end{aligned}$$

$$\begin{aligned} \text{Area of } \triangle ACB &= \frac{1}{2}(4)(4\sqrt{3}) \\ &= 8\sqrt{3} \end{aligned}$$

$$\therefore \text{Area of shaded region} = \frac{32\pi}{3} - 8\sqrt{3}$$

Question 17

In $\triangle RTQ$: $RQ^2 = 1^2 + 1^2$

$$RQ = \sqrt{2}$$

So $RS = \frac{\sqrt{2}}{2}$ cm, given $RS = \frac{1}{2} RQ$

$\angle PRS = 90^\circ$ since faces $RUQT$ and $RPVT$ are perpendicular

In $\triangle PRS$: $\tan \angle PSR = \frac{1}{(\frac{\sqrt{2}}{2})}$
 $= \frac{2}{\sqrt{2}}$

$$\therefore \angle PSR = 54^\circ 44'$$

Question 18 (a)

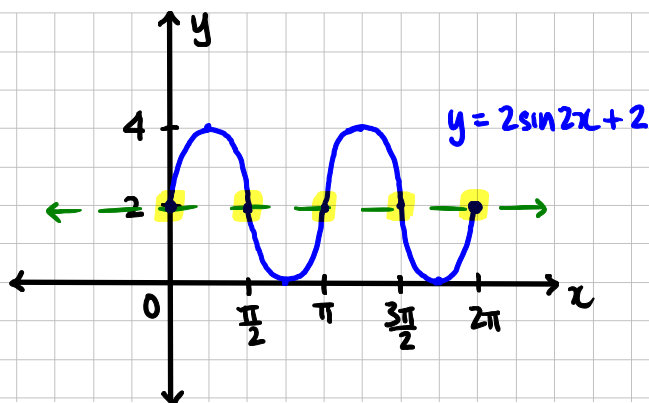
$y = 2\sin 2x + 2$ has $a = 2$, $n = 2$

and translated up by 2 units

$$T = \frac{2\pi}{2}$$

$$= \pi$$

key features every: $\frac{\pi}{4}$

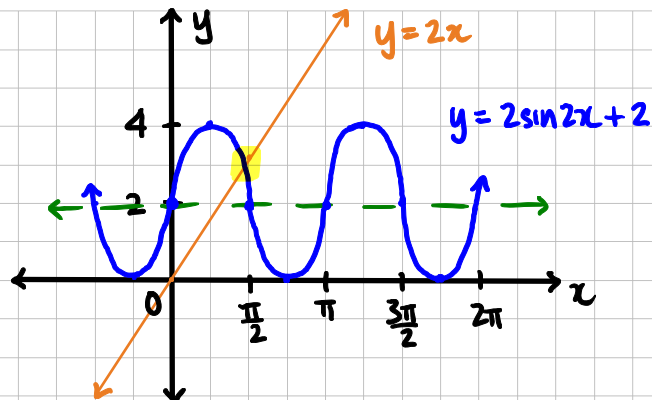


(b) $\therefore x = 0, \frac{\pi}{2}, \pi, \frac{3\pi}{2}$ or 2π (continued...)

Question 18 (c) Solutions to $2\sin 2x + 2 = 2x$ are the points
of intersection for $y = 2\sin 2x + 2$ and $y = 2x$

$$\pi \approx 3.14$$

$(\frac{\pi}{2}, \pi)$ lies on $y = 2x$



$\therefore$ 1 solution

— END OF SECTION II SOLUTIONS —



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